RESEARCH DEPARTMENT

U.H.F. TRANSMITTING AERIAL FOR THE ROWRIDGE TELEVISION STATION

Technological Report No. E-119/1
UDC 621.396.712 1966/23

G.H. Millard, B.Sc., A.Inst.P.

D. Maurice

for Head of Research Department

May 1966 Technological Report No. E-119/1
UDC 621.396.712 1966/23

U.H.F. TRANSMITTING AERIAL FOR THE ROWRIDGE TELEVISION STATION

INTRODUCTION

A u.h.f. transmitting aerial for the Isle of Wight area has been built as a top mast on the existing 438 ft (133·5 m) mast at Rowridge. The new aerial came into operation with trade transmissions on 18th December 1965 and started full service on 16th January 1966.

SUMMARY OF INSTALLATION

Site: The site is 3·5 miles (5·6 km) west-south-west of Newport, Isle of Wight, grid reference SZ/447865, height 450 ft (137 m) a.m.s.l.

Support Structure: The aerial is supported by a 438 ft (133·5 m) stayed mast having a square cross-section of 4 ft (1·22 m) side. The stays are on bearings of 55°, 145°, 235° and 325° ETN.

General Arrangement: See Fig. 1.

Channels: The aerial is designed to radiate on four channels simultaneously. The BBC channels are 24 and 31 of which the former is used for the opening service (BBC-2). The ITA channels are 21 and 27. Channel 24 is operating with zero offset, Channels 21 and 27 will operate with negative offset and Channel 31 with positive offset.

Aerial: The aerial[1] comprises six tiers each of four 4λ panels fed in phase rotation. The power fed to the panels on mast faces C and D (bearings of maximum radiations 139° and 229° ETN respectively) is approximately one-tenth of that fed to the panels on mast faces A and B (bearings of maximum radiation 319° and 49° ETN respectively). The total radiating length of the aerial varies between 22·7λ at Ch. 21 and 26·5λ at Ch. 31. The panels are offset by 3.5/8 in. (92 mm) on a square of 35 in. (889 mm) side, and are supported within a load-bearing glassfibre cylinder of 5 ft (1·52 m) diameter. Fig. 2 shows the arrangement of the panels inside the glassfibre cylinder and Fig. 3 shows the construction of each panel.

The mean height of the aerial is 467 ft (142 m) a.g.l.

Feeders: The distribution feeder arrangement is shown schematically in Fig. 4. Each half of the aerial is connected to the transmitter by a feeder type F and G 4½ - 50. The relative lengths of main and distribution feeders are not the same for each half aerial, although the total length is the same. The actual lengths are as follows:

	Upper half aerial	Lower half aerial
Distribution feeder, HF 7/8	61 ft (18·6 m)	37 ft (11·3 m)
Main feeder, F and G 4½	480 ft (146 m)	504 ft (153 m)

Power: It is planned to use eventually two 25 kW vision transmitters and two 5 kW sound transmitters for each channel. At present only those for Channel 24 have been installed. Each transmitter will be run at the

power required to give the maximum effective radiated power (e.r.p.) permitted under agreements which were negotiated subsequent to the Stockholm Plan.

The service has opened with one vision and one sound transmitter fed into each half aerial but at a later date a diplexer and splitting transformer will be added to minimize the effects of differences between the modulation characteristics of the vision transmitters. Similarly, two- and four-channel combining units will be added later, as required.

Templet and horizontal radiation pattern (h.r.p.):

The h.r.p. was required to be directional in order to minimize interference to co-channel stations on the continent, with an e.r.p. not exceeding 500 kW at the maximum of the h.r.p. The templet and the h.r.p.s at the vision carrier frequencies of each operating channel are shown in Figs. 5-8. These h.r.p.s are the mean of measurements on each half of the final full-scale aerial.

The performance on colour may be degraded on a bearing of 112° ETN on Ch. 21 and on a bearing of 132° ETN on Ch. 31, owing to deep minima at the colour subcarrier frequencies on these bearings.

Vertical radiation pattern (v.r.p.):

The v.r.p. was specified to be gapfilled and the maximum of radiation to be tilted to 0·5° below the horizontal. Gapfilling is achieved by means of a phase distribution of the feed currents over the length of the aerial together with a physical tilt of the panels in Tier 6.* The v.r.p.s obtained for each face, shown in Figs. 9-12, were computed from measurements of the amplitudes and phases of the feeds to the aerial panels, taken after erection. Some degradation of the quality of reception is expected where the v.r.p.s show an appreciable transgression of the specification.

Gain:

Channel	21		24		27		31	
	dB		dB		dB		dB	
Mean intrinsic gain	14·2		14·4		14·6		14·8	
Deduct aerial losses								
Gapfilling	0·8		0·8		0·8		0·8	
Distribution feeder**	0·4		0·5		0·5		0·5	
Distribution transformers	0·1		0·1		0·1		0·1	
Balance load	0·1	1·4	0·1	1·5	0·1	1·5	0·1	1·5
Mean net gain		12·8		12·9		13·1		13·3
Deduct other losses								
Main feeder**	1·0		1·0		1·0		1·1	
Feeder ground run, 30 ft of H.F. 3.1/8-50	0·1		0·1		0·1		0·1	
Diplexer	0·1		0·1		0·1		0·1	
Splitting transformer	0·1	1·3	0·1	1·3	0·1	1·3	0·1	1·3
Mean effective gain		11·5		11·6		11·8		12·0
H.R.P. maximum/mean ratio		4·5		4·1		4·1		3·8
Maximum effective gain		16·0		15·7		15·9		15·8

Programme feed: G.P.O. Link

* i.e. the lowest tier.

** As the lengths of main and distribution feeders to each half aerial differ, mean values of the attenuation are given.

ACKNOWLEDGEMENTS

The mechanical and electrical design, construction and setting to work of the aerial were carried out by the Marconi Co. Ltd. The contracting authority was the BBC Transmitter Planning and Installation Department.

REFERENCE

1. More detailed information on the construction and dimensions of the aerial is given on the following drawings held by Transmitter Planning and Installation Department:

Band IV Panel Aerial : Marconi drawing T80-1439
Assembly similar to : Marconi drawing BT 02-8240 Sheets 1 and 2.

SMW

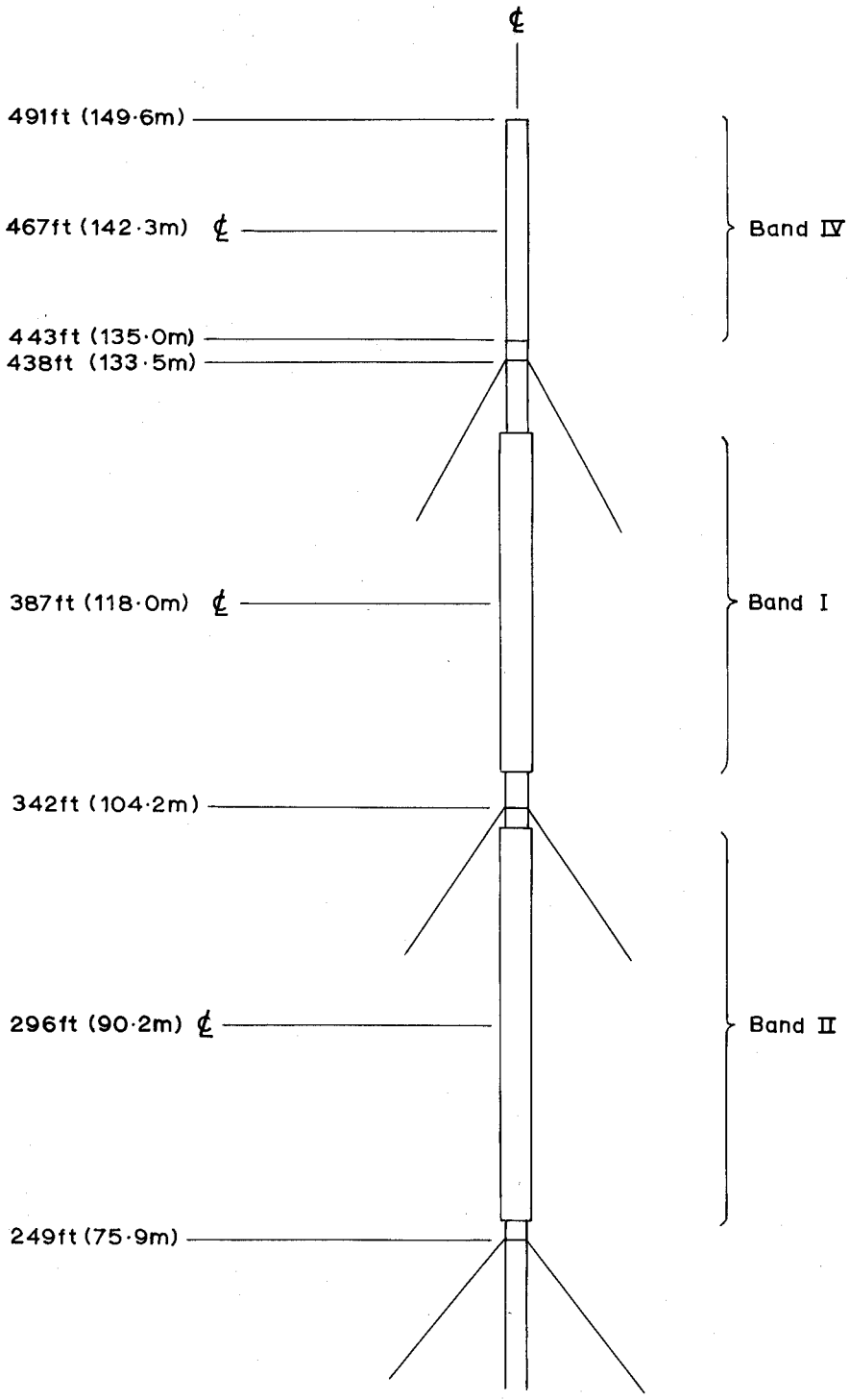

Fig.1. General arrangement of aerials on mast.

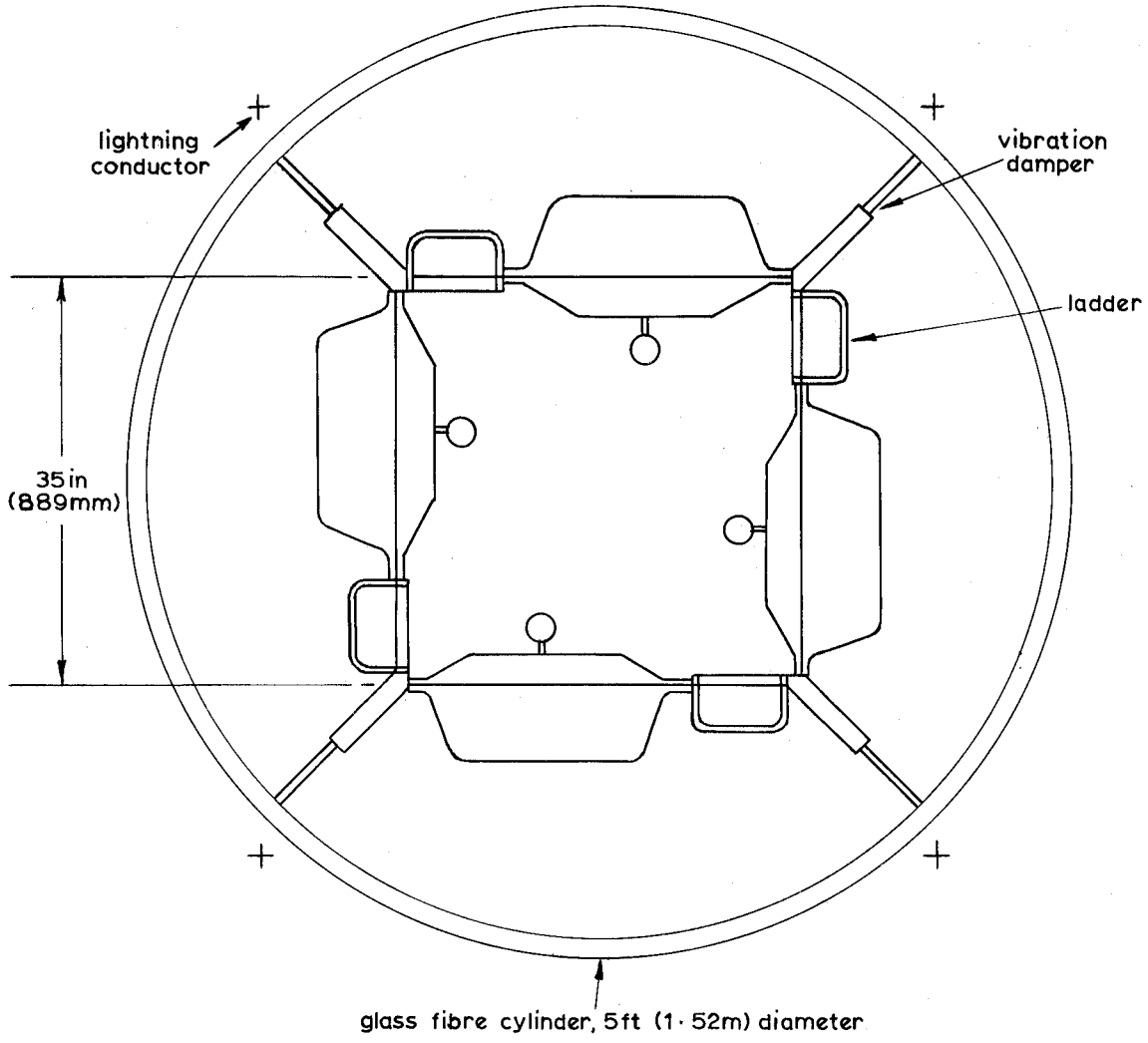

Fig. 2. Arrangement of aerial panels.

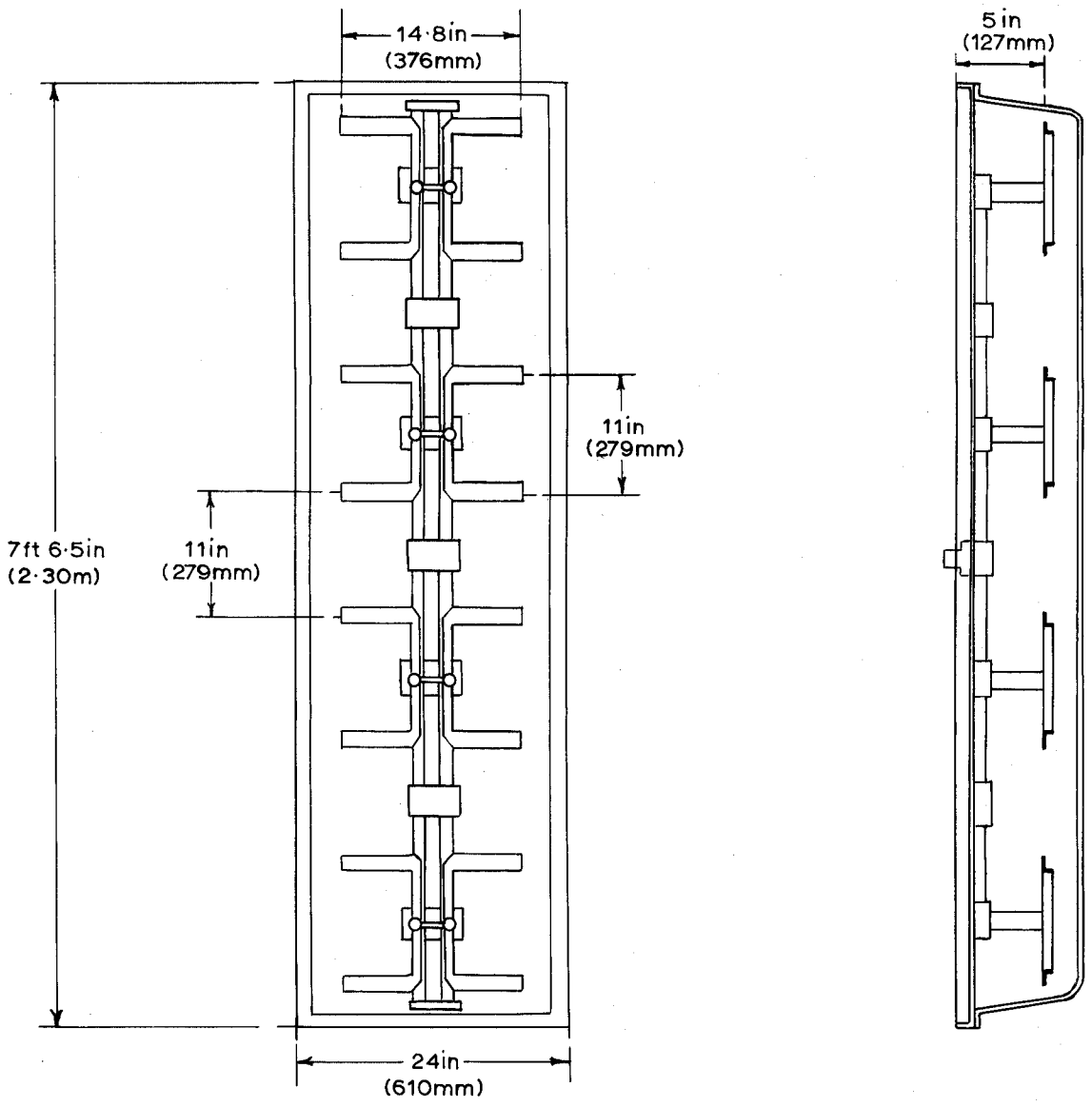

Fig.3. Construction of single panel.

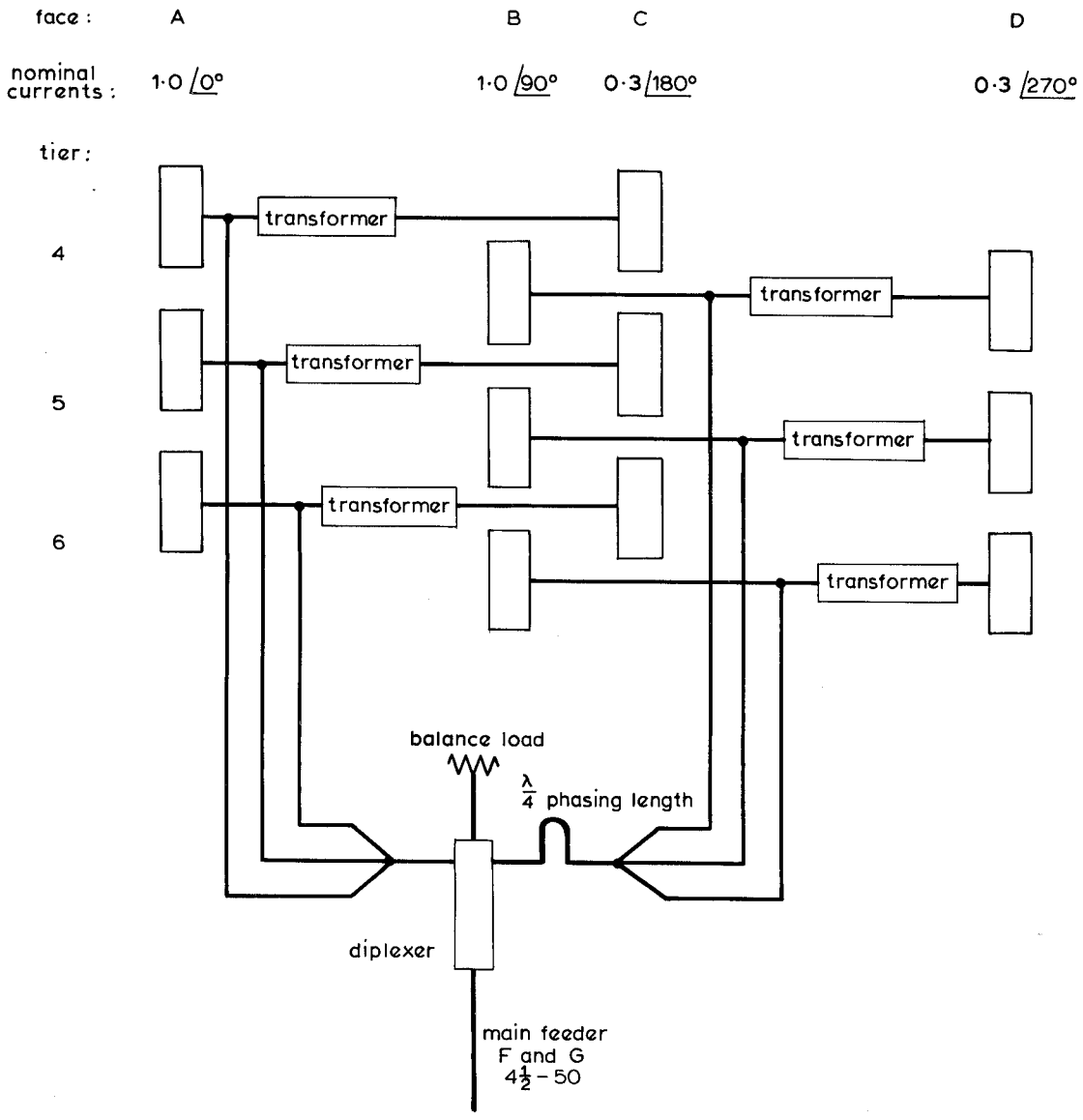

Fig. 4. Schematic of distribution feeder arrangement (lower half aerial)

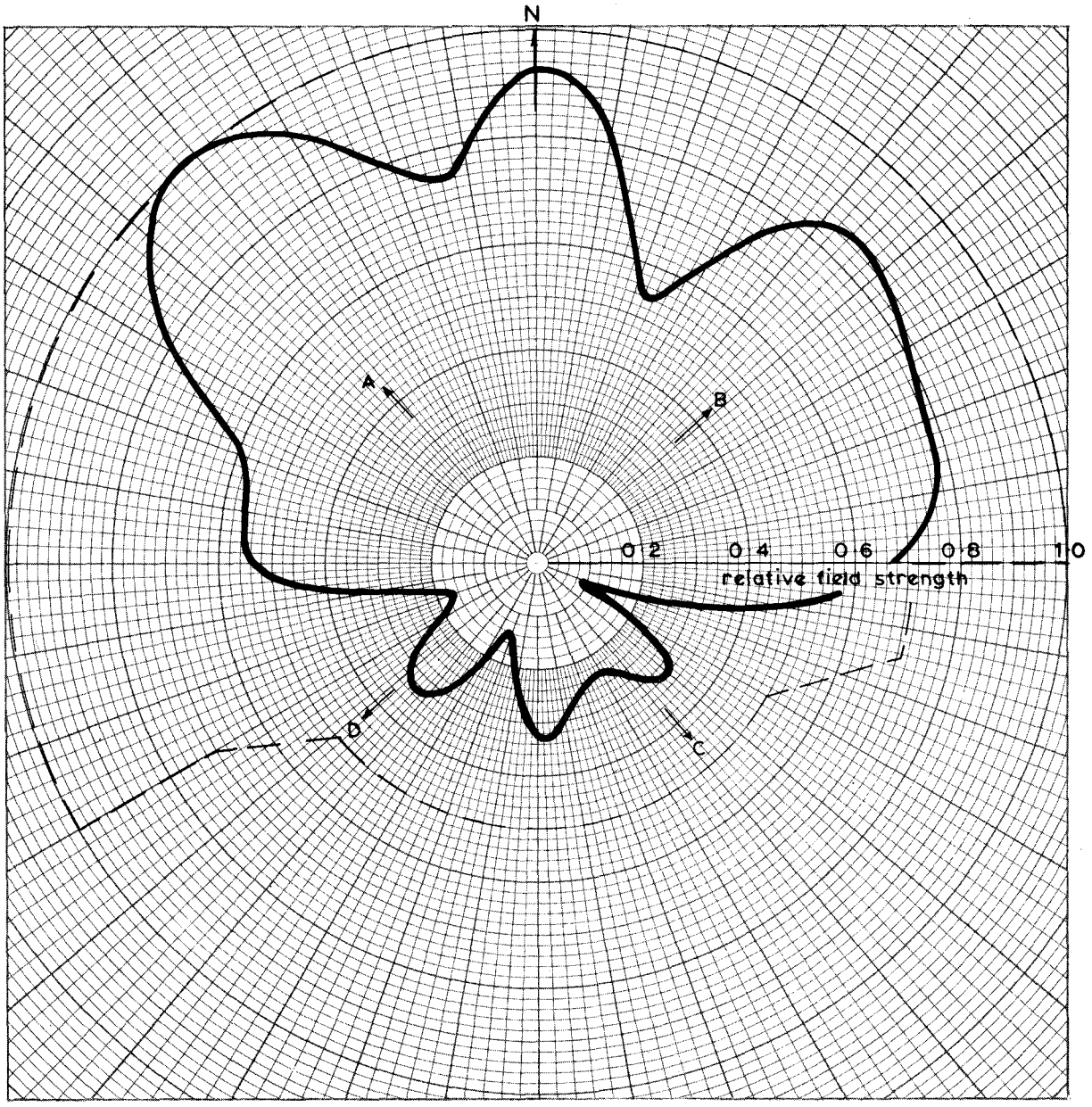

Fig. 5. Horizontal radiation pattern: Channel 21

HORIZONTAL POLARIZATION

Vision carrier 471·25 MHz, Sound carrier 477·25 MHz

Mean effective gain: 11·5dB — — E.R.P. limit agreed post Stockholm

Peak vision transmitter power: 2x6·5kW Mean E.R.P.: 180kW

Unit field corresponds to an E.R.P. of 500kW

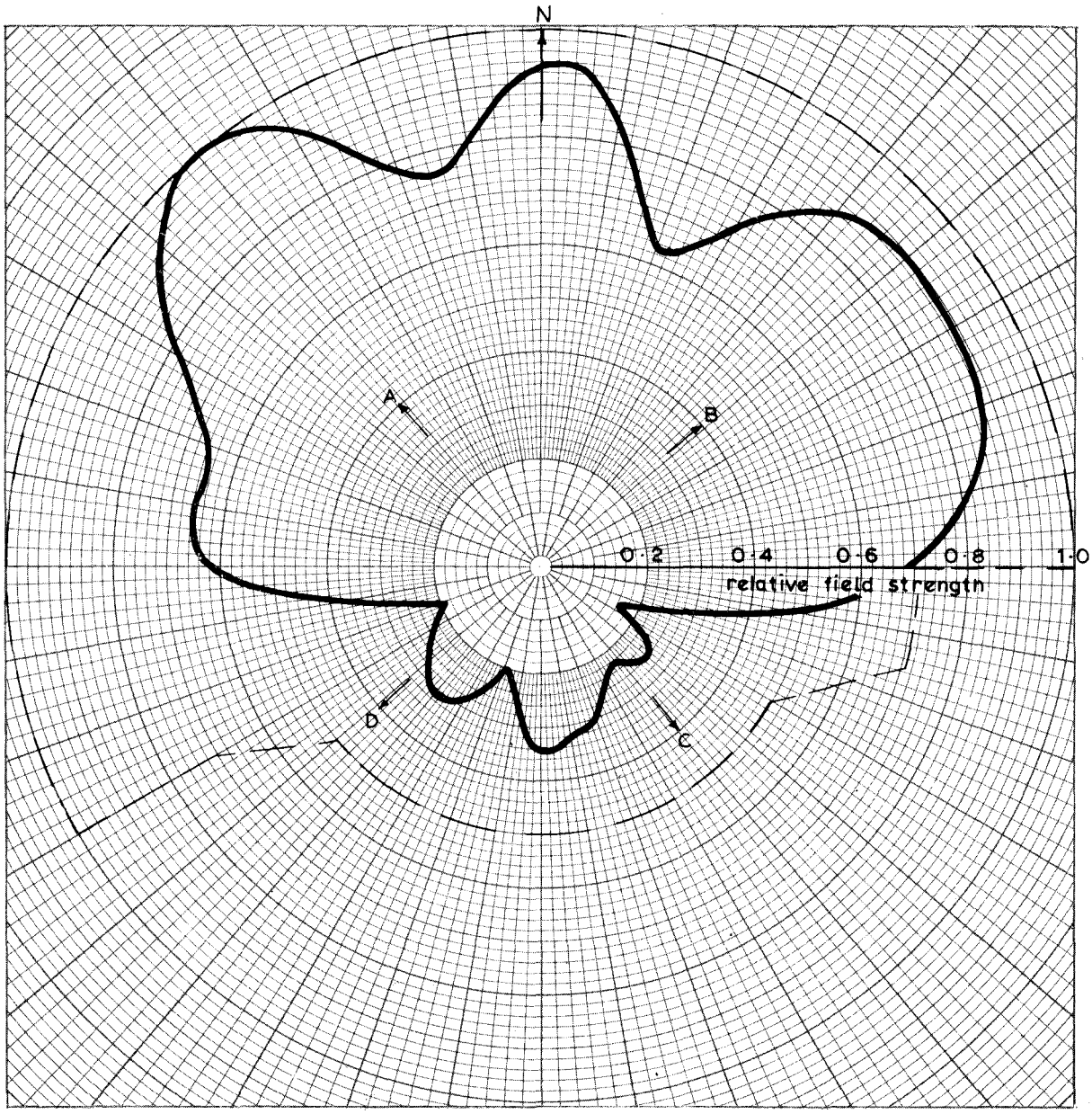

Fig. 6. Horizontal radiation pattern: Channel 24

HORIZONTAL POLARIZATION

Vision carrier 495·25MHz, Sound carrier 501·25MHz

Mean effective gain: 11·6dB — — E.R.P. limit agreed post Stockholm

Peak vision transmitter power: 2x7kW Mean E.R.P.: 200kW

Unit field corresponds to an E.R.P. of 500kW

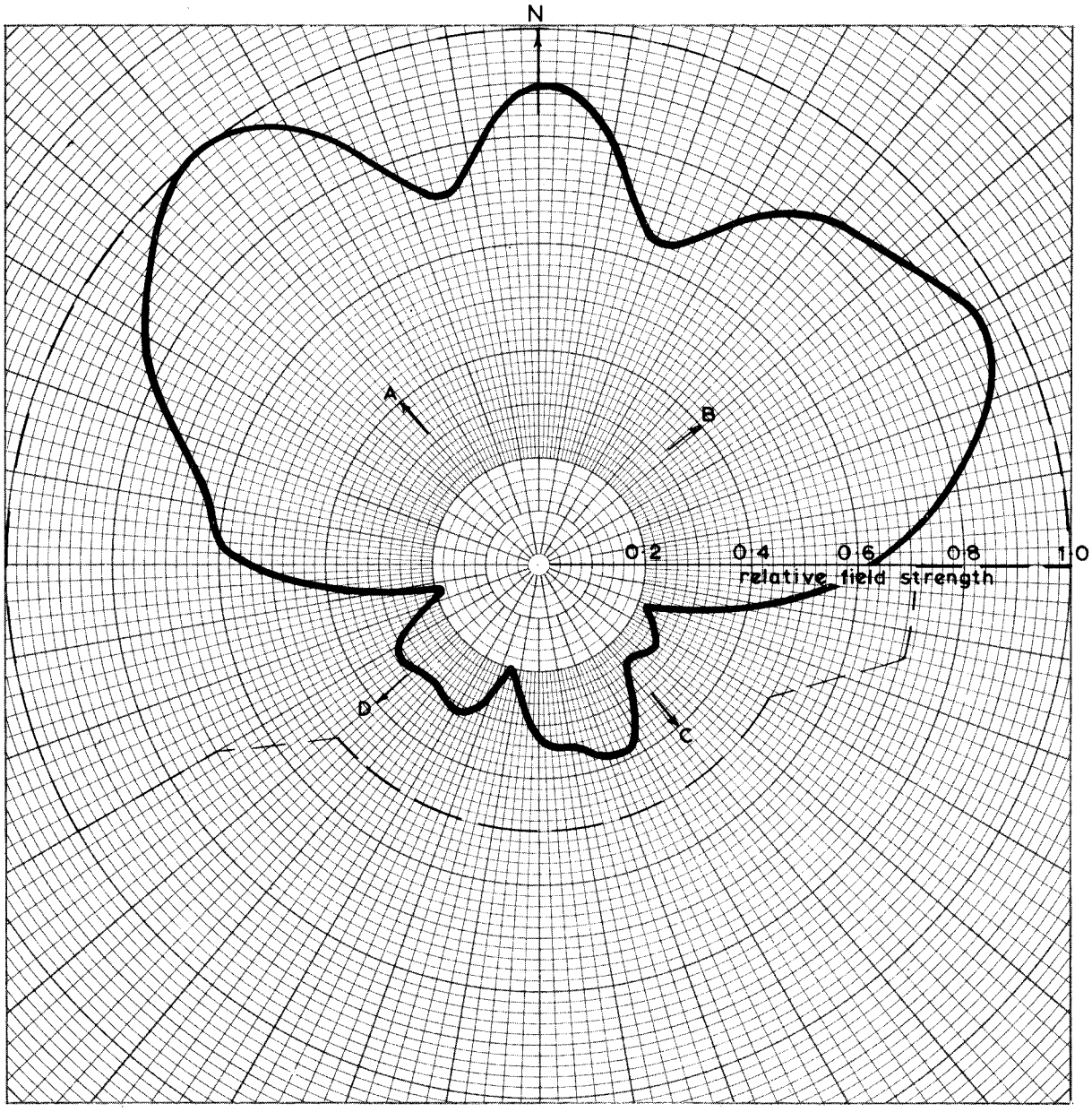

Fig.7. Horizontal radiation pattern : Channel 27

HORIZONTAL POLARIZATION

Vision carrier 519·25 MHz, Sound carrier 525·25 MHz

Mean effective gain : 11·8dB — — E.R.P. limit agreed post Stockholm

Peak vision transmitter power : 2x6·5kW Mean E.R.P. : 200kW

Unit field corresponds to an E.R.P. of 500kW

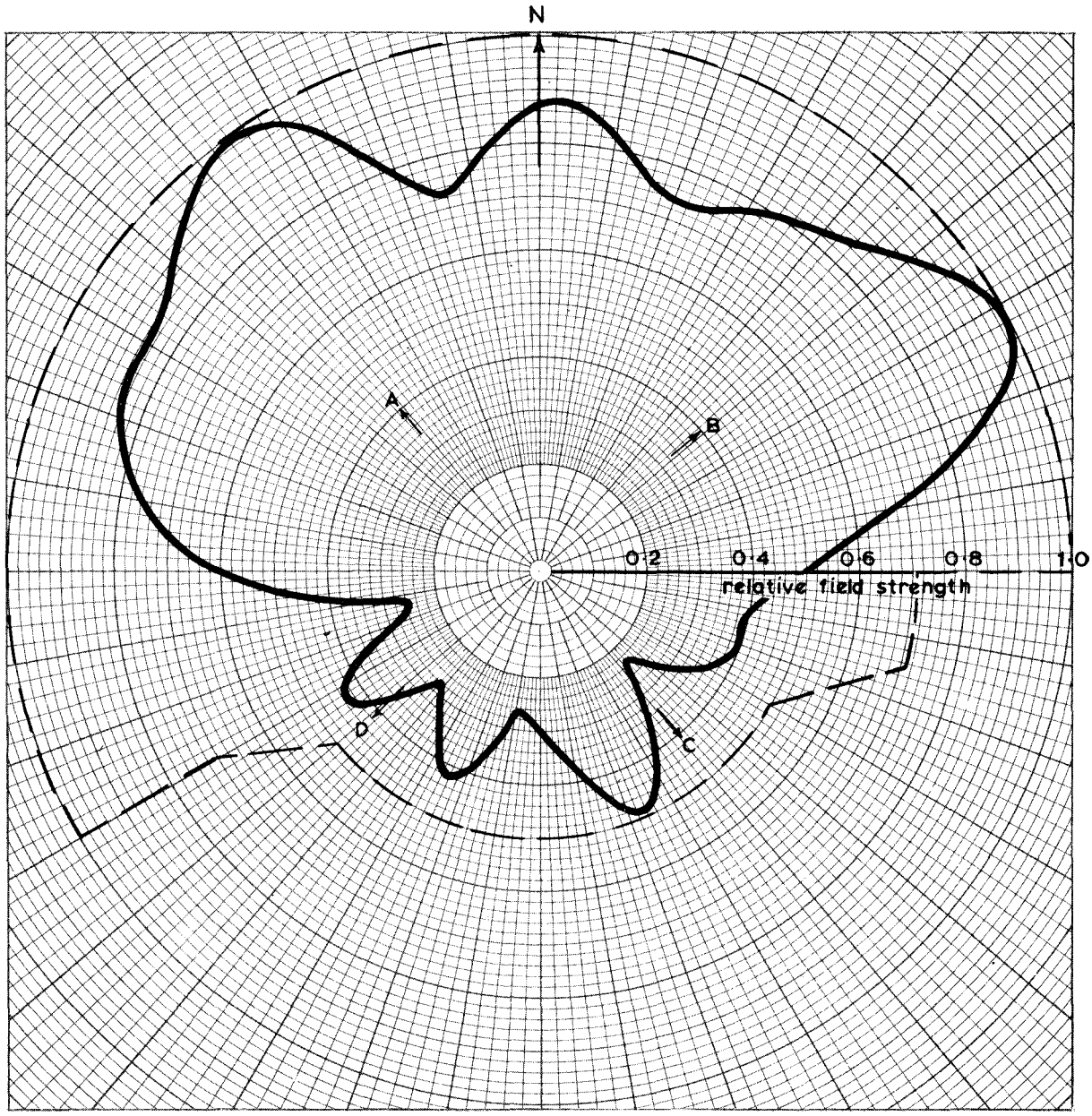

Fig.8. Horizontal radiation pattern : Channel 31

HORIZONTAL POLARIZATION

Vision carrier 551·25 MHz, Sound carrier 557·25 MHz

Mean effective gain: 12·0dB — — E.R.P. limit agreed post Stockholm

Peak vision transmitter power: 2x6·5kW Mean E.R.P. : 210kW

Unit field corresponds to an E.R.P. of 500kW

Fig. 9. Vertical radiation pattern on bearing 49°E.T.N. (face B)

Channel 21 — Channel 24

Channel 27 — Channel 31

Specified minimum field

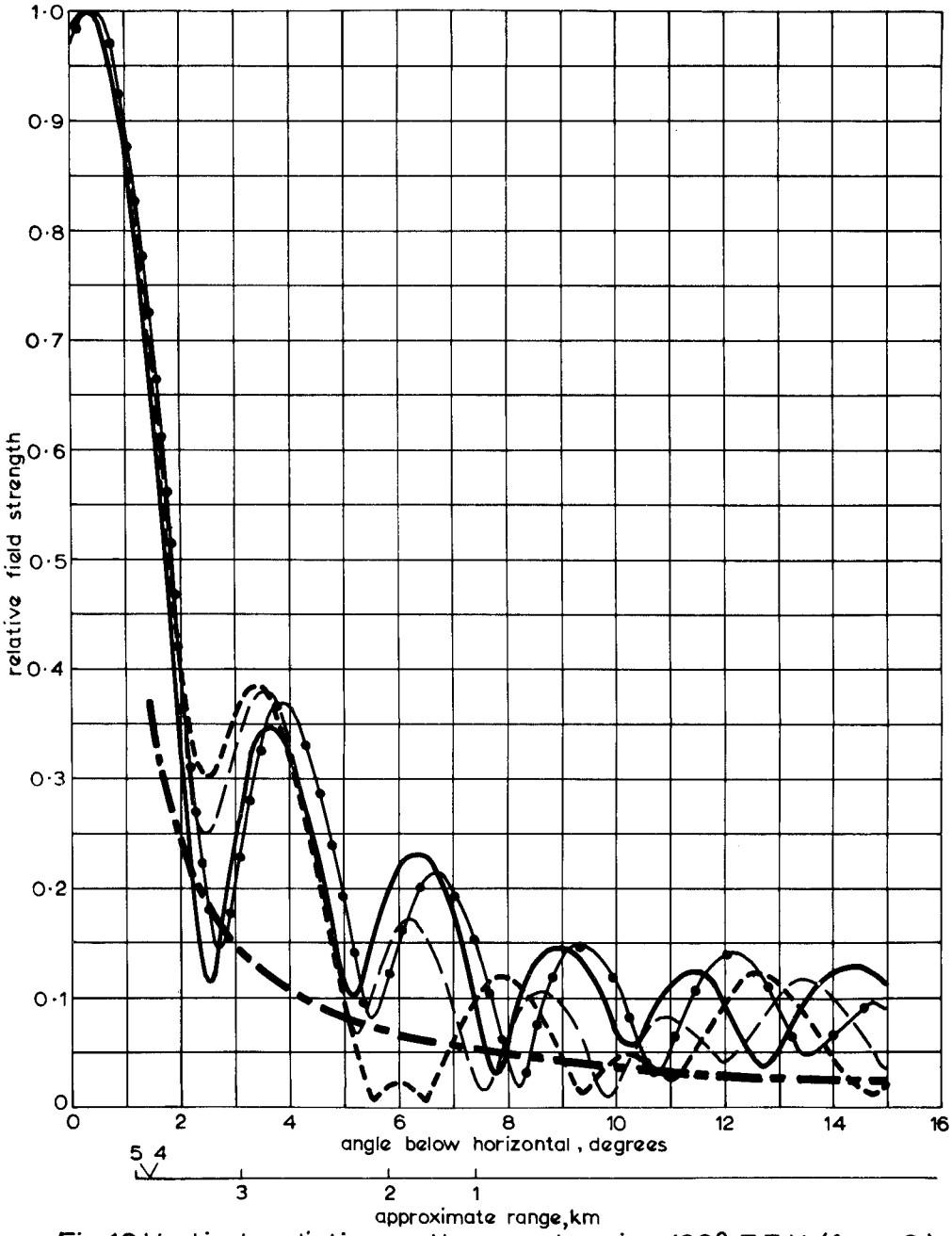

Fig.10. Vertical radiation pattern on bearing 139° E.T.N. (face C)

Channel 21 — Channel 24

Channel 27 — Channel 31

Specified minimum field

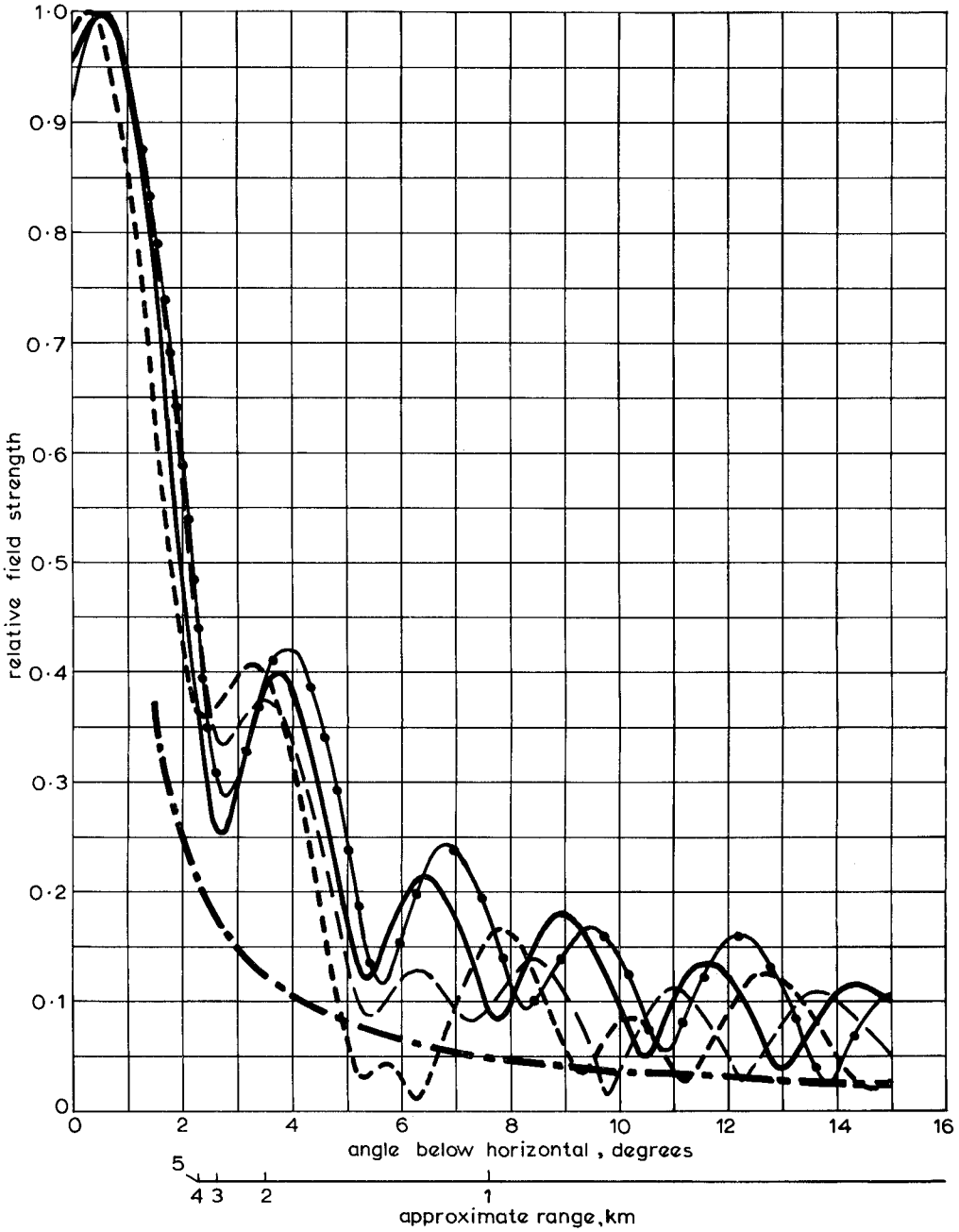

Fig.11. Vertical radiation pattern on bearing 229° E.T.N. (face D)

Channel 21 — Channel 24

Channel 27 — Channel 31

Specified minimum field

Fig.12. Vertical radiation pattern on bearing 319° E.T.N. (face A)

Channel 21 — Channel 24

Channel 27 — Channel 31

Specified minimum field

Printed by BBC Research Department, Kingswood Warren, Tadworth, Surrey